THE OPERANT SPEECH TRAINING OF A CRI-DU-CHAT ADOLESCENT: A SINGLE CASE STUDY

by

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ABSTRACT

The thesis examines the efficacy of using speech training procedures with a cri-du-chat adolescent. Research evidence suggests that neither the 'cat-like cry', laryngeal abnormality or level of severe mental retardation are sufficient to warrant precluding cases of the syndrome from speech training. One aim of the study is to determine whether operant training procedures are more effective than attention-control procedures with a case of the syndrome. The subject is trained in two situations, the individual room and ward, during daily training sessions.

The statistical analysis in the individual room demonstrates that the subject's verbal imitation is significantly greater in the operant than in the control procedures. The results of the subject's verbal object labelling responses to criterion indicates no significant differences between conditions. However, the follow-up assessment shows that the subject retained significantly more verbal object labelling responses to criterion in the operant than in the control procedures. In the ward situation it is argued that operant speech training is significantly more effective than control procedures in increasing the subject's vocalisations to nurses.

Social ratings show that both the subject's socialisation and violent and destructive behaviour increased from the control

to operant procedures.

The overall findings support the view that a cri-du-chat adolescent can benefit from a speech training programme. Furthermore that operant speech training conducted in two situations, an individual room and ward, during daily training sessions is significantly more effective than a combined control approach.

CHAPTER ONE

INTRODUCTION

1.1 SPEECH DEVELOPMENT IN THE CRI-DU-CHAT SYNDROME

The cri-du-chat syndrome was discovered as late as 1963 by Lejeune et al. Chromosomal analysis has described a karyotype of forty six chromosomes, normal except for one large acrocentric chromosome of the B group which has a deleted portion of the short arm. Common clinical features include: a characteristic 'cat-like cry', and severe mental and physical retardation (Lejeune et al., 1963; MacIntyre, 1964; McCracken et al., 1965; Tadashi Kajii et al., 1966; James et al., 1971).

The incidence rate of the cri-du-chat syndrome is between 1 in 50,000 to 1 in 100,000 live births (Polani, 1969). Berger (1968) estimated the incidence to be 0.2 per 10,000 live births. Consequently, because of the low incidence rate of the syndrome, an accumulation of single case studies may be one of the most practical ways of compiling research evidence on the syndrome. Although many studies since Lejeune et al. (1963) have detailed physical aspects of the syndrome there has been a paucity of research on speech development in the syndrome. The literature which is available stresses the need to examine speech functioning in specific syndromes (Spreen, 1965; Zisk & Bialer, 1967; Moore, 1970).

It is postulated that speech research efforts in the past may have been discouraged by the clinical picture of the 'cat-like cry' and common laryngeal abnormalities, coupled with the general level of severe mental retardation in the syndrome. The seriousness of these features to speech research are considered separately.

The Cat-like Cry

The meowing, high pitched cat-like cry is a common characteristic and has been reported in every case of the syndrome. Yet the cry is not pathognomonic. Granoff (1971) noted that spectral analysis of cries produced by infants with congenital hydrocephalus and hyperbilorubinaemia also exhibited abnormal high minimum and maximum pitch. It appears then that the high pitch cry does not, in itself, serve to differentiate the cri-du-chat syndrome from other entities (Granoff, 1971). Further, children with other disorders who exhibit the high pitched cry, for example hydrocephalics, are suitable for speech training. In any event the cat-like cry in the cri-du-chat child appears to decrease in frequency of emission as a function of increasing age (Ward et al., 1968; Junien-Lavillayroy et al., 1972). Therefore the cat-cry should not deter speech research in this syndrome.

Laryngeal Abnormalities

Many researchers report laryngeal abnormalities in cases of the syndrome (Lejeune et al., 1963; MacIntyre, 1964; McCracken

et al., 1965). Ward et al., (1968) after reporting on four cases stated that the anatomical appearance of the laryngomalacia in the cri-du-chat syndrome was distinctive. He offered this as an explanation for the cat-like cry: "The long curved flappy epiglottis, the narrow diamond-shaped appearance of the larynx and the vocal during inspiration, and the anterior approximation of the vocal cords with an abnormally large air space in the posterior commissure area during phonation are responsible for the stridor and the cat-like cry" (Ward et al., 1968).

Other researchers maintained that the anatomical anomalies of the larynx were inconsistent and variable. Tadashi et al.,(1966) performed direct laryngoscopy and found no abnormality of the larynx. Further, Junien-Lavillauroy et al., (1972) claimed that "in about 70% of published cases the larynx is normal or simply hypotonic". As the cry is a constant feature of the syndrome and the laryngeal abnormalities variable, it seems abnormalities of the larynx are not the cause of the cry. The function of the normal larynx is basically to modulate the tone or musical aspect of the voice. It follows that laryngeal abnormalities should not be sufficient to dissuade speech training programmes with cri-du-chat infants.

Level of Mental Retardation

The distribution of reported cases of the syndrome suggests that in the majority of cases "mental retardation appears to be general and profound with an average I.Q. of less than 20" (Niebuhr, 1971). In general, incidence statistics of language dysfunction show that most subjects with I.Q.'s less than 20 are impaired in their language development (Spreen, 1965). Dispite this, improvement is possible in seriously retarded children as Lubman (1955) and Schlanger (1963) have shown. In such cases training should be regarded as making a change, albeit modest, in the status of the person (Jordon, 1967).

The argument posited, therefore is that neither the cat-like cry, laryngeal abnormality or level of severe mental retardation are sufficient to warrant precluding cases of the syndrome from speech trainging programmes. The question arises of what type of speech programme would be best suited to a cri-du-chat infant.

1.2 SPEECH TRAINING PROCEDURES

There are two different approaches to speech development, thebehaviourist and the psycholinguistic. The behaviourist approach is based on an imitation-reinforcement paradigm and provides a very structured set of procedures. The psycholinguistic approach, which holds that speech is biologically determined and under the control of innate abilities, provides no structured set of procedures for the clinician to follow. However, Lee (1973) postulates the view that teaching based upon the psycholinguistic

approach would necessarily be more conversational and more concerned with spontaneous speech than the behaviourist approach. From this view she has generated a Modified Language Input procedure (M.L.I.) which is psycholinguitically oriented.

The Modified Language Input Technique

This technique is presented in a conversational setting. It presents language at a child's developmental level in story form, interspersed with questions which elicit speech from the child. This approach has been successful with children of normal intelligence, with poor auditory perceptual skills. Lee (1973) states herself that the M.L.I. technique is not appropriate for autistic or severely retarded children who do not seem to be able to learn language in a normal conversational setting. She suggests such children may profit much more from the behavioural approaches.

Operant Speech Techniques

As mentioned, operant techniques are based on an imitation-reinforcement model. Empirical research supports the contention that reinforcement accelerates the rate of speech development (Bricker & Bricker, 1970). Further, imitation has been established as effective as the basis for speech and word production training and is considered a powerful speech training technique (Wolf &

et al., (1964); MacAulay, 1968; Lovaas, 1968).

Success of Operant Techniques

Operant techniques have been used to correct inappropriate speech patterns (Risley & Wolf, 1967), to reinstate speech in currently mute persons who previously spoke (Issacs, Thomas & Goldiamond, 1960), and to develop simple speech in children who have never talked (Lovaas et al., 1966; Sloane et al., 1968; Guess et al., 1968; Sailor, 1970).

Generally the success of operant speech techniques has been promising. Due to the need to individually tailor a programme to a child's particular requirements most of the research reports have been single case studies. For example, Sloane et al., (1968) found that a young mongoloid boy significantly increased correct verbal imitations when reinforcement was contingent on such responses as compared to when reinforcement was non-contingent. In another study a four year old retardate whose speech consisted of only a few vocalisations was trained in eight months to produce forty different words that could be reliably recorded as approximations to English (Sloane et al., 1968). Risley & Wolf (1967) found that after five sessions of reinforcement training a severely retarded eight year old learnt to reliably imitate, and appropriately name objects. Lovaas et al., (1967), who have detailed a step by step operant programme, suggest that while initial progress may be painfully slow, the progress may speed up

after the first steps. For example, with Billy, an autistic child it took several days to train a single word, but in the final stages of the programme he learnt several words a day. Clearly, there has been a good deal of evidence for the success of operant techniques with a variety of cases of speech deficient children, including autistic, brain damaged, mongoloid and severely retarded. It would seem appropriate therefore to apply operant speech training to a cri-du-chat child. Accordingly the study aims to evaluate the effectiveness of operant speech training techniques in increasing the verbal behaviour of a cri-du-chat adolescent. Detailed components of the operant methods are discussed in the following section.

1.3 OVERVIEW OF OPERANT SPEECH TRAINING PROGRAMMES

In general, experimenters approach the deliberate development of functional speech in nonverbal or speech deficient subjects in a two tier training programme. Firstly, the subject learns to emit a given verbal response following the presentation of a cue or descriminative stimulus in order to receive positive reinforcement. Similarly he learns to avoid responses which immediately result in negative reinforcement. In this way the subject is taught imitative verbal behaviour. In the second broad phase of speech training programmes the aim is to teach fuctional and spontaneous speech across a variety of settings, using a number of therapists as trainers (Garcia & DeHaven 1974). Ultimately it is

intended that the trainee should use his new vocabulary in his natural environment.

Verbal Imitation Training

It seems that verbal imitation training is generated from the observation that "Children acquire words by hearing speech; that is, children learn to speak by imitation" (Lovaas 1968). This represents an empirically-based approach to the problem of speech development. Peterson (1968) claims imitation is a basic behavioural mechanism. He defines an imitative response as follows: "We call a response imitative when one individual behaves to match the response of a model".

The sufficient conditions for acquiring any imitative repertoire need to be made clear. Research evidence suggests that observers trained under nonreinforcement conditions imitated more than controls exposed to no model (Bandura et al., 1961; Berger 1966; Kanfer & Marston 1963). Flanders (1968) also found that observers trained under nonreinforcement conditions imitated above chance. Thus it would seem that nonreinforcement training conditions are sufficient for acquiring at least some imitative behavioural repertoires.

It follows that it is necessary to clarify the role of reinforcement in the modelling process. Bandura (1969) proposes a compelling analysis of observational learning. He posits it is

essential to distinguish between response acquisition and performance because these events are determined by different variables. Bandura (1965) from a controlled experiment found that the acquisition of matching responses results primarily from stimulus continuity and associated symbolic processes, whereas the performance of observational learned responses depends largely upon the nature of reinforcing consequences to the model or to the observer. Therefore, contingent reinforcement alters the performance rate but does not, per se, explain how a response is initially acquired. It seems the explanation of acquisition is to be sought in terms of mediational variables. The elucidation of such variables is not the subject of this study, suffice to say that attention, retention and motor response modes are important components.

In training verbal imitation of new responses or words it appears a basic first step is to assess the subject's range of vocalisations or sounds. The second step is then to combine the basic behavioural units or sounds to form words. A certain amount of shaping of some basic response elements is probably necessary even when the child is fully imitative. Such imitation training may allow the subject to combine and recombine basic behavioural units or sounds into new response chains or words. For example, since the child has acquired or is emitting some of the basic vowel and consonant phonemes he could easily chain them together to form new words to be learned by imitation (Peterson 1968). Clearly, verbal imitation is an important step in acquiring speech.

Consequently, one aim of this study is to evaluate the effectiveness of operant speech training procedures in increasing verbal imitation in a cri-du-chat adolescent.

In cases where the child is non-imitative, or has a deficient imitative repertoire, it is suggested that the first step in a speech programme should be to develop motor imitative skills prior to verbal imitative skills. The fundamental assumption here is that gross body movements would be easy to discern, and that motor imitation would facilitate the learning of verbal imitation. As this issue is clearly of clinical importance it will be discussed at some length.

Stark et al., (1968) reported a programme to increase verbal behaviour in an autistic child. Following the child's initial failure to imitate vocalisations, the experimenters attempted to establish a nonvocal imitative repertoire. They reasoned that gross body movements would be more easy to discriminate than fine body movements. "More discrete stimuli such as movement of the tongue, lips and jaw, could then be introduced and a gradual transition from nonvocal imitation of mouth movements to imitation of sounds could be accomplished" (Stark et al., 1968). Other researchers have also adopted the approach of training a number of simple motor imitations prior to training vocal imitations.(Hewett 1965; Baer, Peterson & Sherman 1967; Sloane et al., 1968).

However, an opposing body of researchers reported success in remedial speech training and have omitted the motor imitative component (Risley & Wolf, 1967; Kerr, Meyerson & Michael, 1965). Results of the Garcia, Baer & Firestone (1971) study indicated that training motor imitative responses produced generalisations to other similar motor responses, but not to untrained vocal responses. Indeed a subject in the Baer et al., (1965) study had developed extensive motor imitations but did not imitate a verbal response. Baer et al., decided to combine or couple verbal-motor responses, here the verbal response was paired with an imitative motor response. For example, the experimenter walked to the centre of the room and said 'ah'. The child approximated the response. The verbal-motor coupling was continued with a general reduction in the amount of motor imitation until the verbal response was initiated while both subject and experimenter were seated (Peterson 1968). From this point modelling and differential reinforcement were used to expand the vocal repertoire.

From a treatment standpoint, the important issues still unanswered concern the differences in the success of procedures used to establish vocal imitations. Such answers are necessary for the establishment of economic treatment programmes (Garcia & DeHaven 1974). That is, it is not clear whether motor imitation facilitates the acquisition, retention or generalisation of vocal imitative behaviour. In this study it is considered that verbal imitative behaviour is the primary initial target, and as such it will be emphasised in the training sessions. Motor

imitation training will not be stressed, although it must be stated that an attempt will be made to over emphasise tongue and mouth movements in the production of target sounds. To this extent it is acknowledged that there will be a coupling of motor and verbal components in the presentation of training stimuli. An evaluation of the effectiveness of the separate motor-verbal components will not be attempted. It is felt that research into this area may provide more comprehensive and economical speech training programmes.

The theoretical thrust underlying the argument that motor imitation training may facilitate later verbal imitation is implicitly derived from the concept of generalised imitation (Baer et al., 1964). Briefly, it was found that imitative behaviour would develop if the child was rewarded for imitating. It was also found that imitative behaviour that had never been reinforced could be developed and maintained as long as other imitation responses continued to be reinforced (Metz, 1965; Peterson 1968). The non-reinforced imitations, maintained under these conditions, have been termed 'generalised imitations' (Baer & Sherman, 1964). Theoretical explanations of this phenomena include conditioned reinforcement (Lovaas et al., 1966; Baer & Sherman, 1964), the discrimination hypothesis (Bandura 1969), the reinforcement scheduling explanation (Gerwitz, 1968) and Steinman's explanation. Each of these explanations will be considered separately.

1. Baer et al., (1967) argues for the conditioned reinforcement

explanation, stating that for an imitative repertoire to develop, a class of correspondences must be functional as stimuli. The child must learn to discriminate a similarity between the model's behaviour and his own. Similarity used in this sense does not refer to similarity along a simple stimulus dimension, for example, in the intensity of light, but to a correspondence between the stimulus output of the child's behaviour and the stimulus output of the model's behaviour. For example, the child perceives a correspondence between the appearance of his hand and the model's hand or his voice and the model's voice as a silent stimulus. (Baer et al., 1967). In summary, assuming that behavioural similarity is accepted as a stimulus, this stimulus often preceeds reinforcement, and therefore can develop conditioned reinforcement properties. However for the conditioned reinforcement explanation to be tenable it must account for empirical evidence that differential reinforcement is effective under a variety of circumstances including verbal operant training. For this reason the value of the conditioned reinforcement explanation of generalised imitation is in some doubt.

2. The discrimination explanation suggests that the child continues to perform non-reinforced imitations because he cannot discriminate reinforced from non-reinforced responses.

3. The reinforcement scheduling explanation emphasises one aspect of the discrimination problem, that is, the variable-ratio schedule character of generalised imitation procedures. Simply stated, this means that the child is unaware of which response will be reinforced and so imitate every response modelled.

4. Steinman (1970) suggests a combination of differential reinforcement and social variables as an explanation for generalised imitation. He reports data that challenges the 'discrimination' and 'scheduling' explanations. His evidence suggests that children would imitate both reinforced and non-reinforced responses if no choice was offered. In contrast, when instructed not to imitate responses that produced no reinforcement they immediately stopped imitating most of the non-reinforced responses. Steiman's conclusion is that even though a child knows a response will not be reinforced he may still imitate the response if it is the only response modelled, and if he has not been instructed to imitate only reinforced responses. When a response is modelled the past and present instructions to imitate and the presence of the adult model may function to increase the probability the child will respond imitatively.

The importance of social stimuli in maintaining imitative behaviour was reported by Peterson & Whitehurst (1970) in an experiment where differential reinforcement was applied to one training response and not another. The child imitated both responses. However, when the trainer ceased watching any imitative behaviour, such behaviours were extinguished. Consistent with this experiment, Steinman (1970) argues that two controlling systems may operate simultaneously when generalised imitation procedures are used. One system being contingent differential reinforcement, the second system, a composite of social setting events : "The reinforcement characteristics of the model, the continued surveillance by the model, and the child's previous history regarding adults, their instructions, and the consequences received when the child has complied or failed to comply with their instructions" (Steinman, 1970).

The question arises as to whether either or both of differential reinforcement and social demand characteristics are necessary for the development and maintenance of generalised imitation. As stated earlier, studies in modelling have successfully developed imitative behaviours without specifically manipulating consequent reinforcement (Flanders 1968; Bandura 1969). As stated also, differential reinforcement increases the performance of imitative behaviour (Bandura 1969). Generalised imitative behaviour is observable. It seems the 'discrimination' theories provide one explanation. However, whether these theories

provide a correct or complete explanation is a moot point. Certainly Steinman (1970) has shown that social variables must be accounted for in ongoing research.

As mentioned, operant speech training procedures are presented in a two stage programme. The second stage which includes expressive speech will be discussed below.

Expressive Speech

Vocal imitation training is followed by vocal labelling, question - answer procedures and other more complex forms of speech, ranging from productive speech (Guess et al., 1968) receptive speech (Baer & Guess, 1971), pluralisation rules (Guess et al., 1968) to the generalised use of comparative and superlative adjectives, and the productive use of noun suffixes (Baer & Guess, 1973).

The present research will be limited to verbal object labelling, as in Sloane's 1968 study of a non-verbal severely retarded child. Sloane's child was taught to name simple objects and pictures by imitating the experimenter. To ensure correct discrimination between the target objects, the experimenter's prompts, that is verbal clues were faded until the experimenter presented the objects and stated 'What is this?'. The object then controlled the choice of response.

In the initial phases of the programme it seems efficient training is facilitated by structuring the training environment, limiting disruptive behaviours and conditioning attention and eye contact (Hartung 1970). It is the aim of such programmes that as the subject begins to establish expressive speech there will be a concomitant increase in attentive and social behaviours. It is expected that even when a child has mastered two or three words he will be able to immediately experience considerable control over his environment (Lovaas, 1968).

The procedures involved in establishing eye contact and environmental control are well illustrated in a classic study by Hewett (1965). Hewett (1965) applied an operant conditioning speech programme to establish a basic speaking vocabulary in a four and a half year old non-verbal autistic boy. He suggested that autistic children were highly selective learners who obtained gratification by bizzare, inappropriate means. Following from this assuption Hewett designed an elaborate programme and maintained rigorous environmental control in the initial stages. A teaching booth was established, the teacher on one side, the subject on the other, and a dividing shutter between them. A light focused on the clinician's side of the booth. When the shutter was lowered the subject was deprived of light, rewards, and the presence of the experimenter. Using this apparatus therapeutically the subject was progressively taught to imitate a range of vocalisations. In the final stage of the

programme the subject was returned to the ward. Verbal imitation generalised from the experimenter and the booth to other adults and even children in the ward environment. At the conclusion of the programme the subject had acquired only a limited vocabulary, but was able to verbally express some of his basic needs, for example, 'I want water'.

Schneider & Vallon (1955) comment that "The mere ability to express one's wants or needs in a socially accepted manner..... is indeed a valuable asset to the child on an intellectual, an emotional, and a social level". This statement reflects the significance of Hewett's (1965) results. Indeed a further finding in Hewett's (1965) study was that the subject's verbalisation altered the reaction of others towards him. "This was clearly seen when nursing staff sought him out for verbal interaction, providing cues for imitation and holding him for speech before granting his requests" (Hewett, 1965). It is claimed that a retardate, who can speak in the ward attracts nurse attention more than a non-verbal retardate.

While the Hewett (1965) study and other research studies report the positive effects of operant conditioning techniques on verbal behaviour, only a few researchers have presented a systematic, explicit account of how to go about developing speech in non-speaking children (Hartung, 1970). One of the most explicit and detailed set of procedures has been outlined by Lovaas (1966; 1968) and is discussed below.

1.4 THE LOVAAS SPEECH TRAINING PROGRAMME

The Lovaas programme provides a step-by-step procedure to follow and also allows the clinician to make appropriate clinical decisions, so that he can adapt the programme to the child's needs. Lovaas suggests it is beneficial to approach the children in an individual, empirical manner, and to allow the programme to provide guidelines (Lovaas 1968). Consequently the programme is not meant to represent a 'cookbook approach' (Hartung, 1970).

Lovaas' programme was developed for autistic children. Autistic children are typically highly distractable and often engage in bizarre and other inappropriate behaviours. The speech programme gives clear instructions on how to manage inappropriate behaviours which may lead to an attentional deficit and detract from the teaching process. Severely retarded children are similar to autistic children in their inattentiveness in a teaching situation, and engagement in inappropriate behaviours. According to Maggs (1974) "....the retarded population are.....deficient in attention to the extent that impairment of attention has come to be a major disruptive factor in delineating the behaviour of the retarded". Therefore it seems that the programme is appropriate for both autistic and retarded children.

The Lovaas programme first teaches the subject to verbally imitate and then to express the acquired sounds or words in an

appropriate context for speech. To help select the initial set of sounds for training, Lovaas recommends the following criteria : select those sounds which have concomitant visual components, for example, open mouth vowels like 'a', and the sounds which can be prompted, for example, 'b'. The present experimenter suggests the further criterion of assessing the subject's phonetic developmental age, and then training him with a developmentally realistic range of sounds as outlined by Templin (1957).

Following the selection of these 'sounds' reinforcement training is commenced. Initially, a continuous reinforcement schedule is applied, that is, every instance of a vocalisation is followed by reinforcement. The rationale for using continuous reinforcement is two fold. Firstly, it accelerates learning (Sloane et al., 1968), secondly, it encourages a positive relationship between the experimenter and subject. A study by Finch et al., (1975), underscores the value of such a relationship; he reports that significantly more imitative responses were emitted to a model rated as most liked by the observer than to a model least liked. Gradually reinforcement becomed contingent on the correct response, that is, differential reinforcement is used by the clinician.

To increase the probability of the subject emitting the correct response the technique of prompting and fading are employed.

A prompt is "a stimulus which cues the correct response prior to training, or with minimal training" (Lovaas 1968). For example, by holding and guiding the child's lips, the clinician can evoke the desired response. The prompting is then slowly faded. Fading is "the gradual removal of prompts over trials" (Lovaas, 1968). For instance by moving the fingers away from the mouth to the cheek, then by placing them on the jaw, until the subject can emit the correct response without aid. Once the subject can label an object, that is, emit a correct verbal response, Lovaas suggests the experimenter should test the subject's ability to label the object in the presence of a distractor object.

The efficiency of the Lovaas operant speech programme has been reliably shown in the individual training situation. Lovaas (1968) suggests that if training was extended to more than one situation that the learning would be greater and more resistent to forgetting over time. For this reason training will be carried out in more than one situation in this study.

1.5 ADAPTION OF THE LOVAAS SPEECH TRAINING PROGRAMME TO THE PRESENT STUDY

To further maximise the probability of effective intervention the design of this study will include speech training in two situations, that is, in an individual training room, and in the ward setting. The rationale for this approach rests on the

premise that training in two situations, with a variety of therapists in the natural environment will increase the probability of a greater speech learning effect, and generalisation of speech taught. Support for this premise is derived from research which has attempted to extend speech training into the individuals everyday environment (Risley & Wolf, 1967; Lovaas et al., 1968). Further, evidence would suggest that variations in training situations and/or use of more than one speech therapist would facilitate generalised speech usage in addition to specific training stimuli (Garcia & DeHaven 1974). Accordingly, another aim of this study is to determine the effectiveness of operant speech training in increasing generalised verbal behaviour.

It was reasoned that as nurses are in everyday contact with the subject they would be the obvious choice as effective speech trainers for the subject. The principle of nurses acting as speech trainers on the ward is analogous to Lovaas' et al., (1967) study where parents were using the training procedures in the child's day to day environment.

It follows that the design of the present study will attempt to maximise the learning effect by giving treatment or training in two settings, individual training room and the ward, during the same time period (that is, on the same day). The effect of interaction between training in the individual training room situation and learning in the ward situation was basic to

the design, and the separate effects in either training room or ward were not intended to be partialed out. It is possible to compare the experimental and control conditions in terms of the evaluative measures used in the individual training room situation. Similarly, a comparison between the two conditions can be made using the evaluative measures adopted in the ward situation. In interpreting the results in either situation the interactional training effect must be taken into account. It seems reasonable to assume that if the effect produced in the experimental condition is significantly greater than the effect of the attention-control condition in both training situations, then the total behavioural procedure can be said to be more effective than the combined attention-control procedures.

The effectiveness of the behavioural procedures will be tested by use of a single case design.

1.6 SINGLE CASE DESIGN

Single-subject designs have been described and advocated by research investigators (Dukes, 1965; Shapiro, 1966; Edgington 1967, 1972; Yates, 1970; Barlow et al., 1973; Birbrauer, 1974). The aim of such design is to relate changes in behaviour to changes in treatment or independent variables. The claim is made that all that can be required of any experimental clinical study is that as far as possible "the results of the experimental

operations can be meaningfully related to the operations themselves" (Yates, 1970). When a design permits such a conclusion, internal validity has been achieved.

Methodologically the single case design is tenable. From the point of view of "statistical inference, per se, the intensive single case can be considered as providing data sampled from a statistical distribution or population defined by a set of parameters or characteristics of the patient under study" (Chassan, 1969). Further, the intensive model capitalises on variability within a given subject. Changes in states can be systematically related to patient characteristics. Consequently, each subject serves as his own control, and factors such as sex, age, genetic endowment, which are rarely satisfactorally controlled in extensive design, are held constant.

Therefore the single-case design is held to be a viable research design. The present study employs a single case design for three aims:

1. To evaluate the effectiveness of operant speech training procedures in increasing verbal imitation in a cri-du-chat adolescent. Verbal imitation refers to the subject's correct vocalisation of the experimenter's verbal response.
2. To evaluate the effectiveness of operant speech training procedures in increasing verbal object labelling in a cri-du-chat adolescent. Verbal object labelling refers to

the subject's verbal labelling of training objects independent of the experimenter's verbal cues.

3. To evaluate the effectiveness of operant speech training procedures in increasing generalised verbal behaviour in a cri-du-chat adolescent. Generalised verbal behaviour refers to the subject's entire range of verbal behaviour in the ward.

CHAPTER TWO

METHOD

2.1 SUBJECT

The subject (M.M.) was a 16 year old severely retarded boy. He was assessed on the Binet as functioning at I.Q. 15. Chromosomal analysis revealed that all cells analysed had deleted short arms of the member of the B group chromosomes. (Appendix 1). This confirmed the clinical diagnosis of cri-du-chat.

M.M.'s parents reported that he sat at 14 months, but never walked or talked properly. At 3 years he uttered sounds which seemed to his parents to approximate a couple of words. M.M. has been institutionalised since 4 years and has a history of the 'cat-cry'. However, he had apparently not emitted the 'cat-cry' at the time of the present study. This evidence would be consistent with the view that the 'cat-cry' decreases as a function of age. (Julien - Lavillaroy et. al.,1972; Ward 1968).

A laryngoscopy examination by a medical practitioner had found that the subject had a funnelling of the larynx which could be said to be abnormal. (Appendix 2.) Despite this laryngeal abnormality the subject was able to vocalise sounds satisfactorally. A speech therapist defined the subject's sounds as nasal, but stated that he could emit a range of articulate sounds as well as the word 'ball' and 'man'. On the Phonetic Year Scale he

appeared to have attained the 3½ year level (M,P,B,W,H,N,T,D,G,J). These sounds served as the basic behavioural units from which the training words were built.

The subject's behaviour was rated on the Adaptive Behaviour Scale. Scores were expressed in percentile rank and indicate M.M.'s level of functioning in relation to institutionally retarded persons of similar age. The following selected scores suggest the subject's adaptive behaviour:

Independent functioning - 19

Language development - 15

Socialisation - 9

Violent & destructive behaviour - 55

Withdrawal - 85

Self-abusive behaviour - 92.

Prior to the study the subject's ability to imitate was established. He was able to imitate simple verbal & non-verbal behaviours, for example, he could imitate the sound "m", and the behaviour "clap hands". Therefore it was anticipated he would be capable of benefiting from the operant speech training programme.

2.2 DESIGN AND PROCEDURE

The design entailed the application of attention-control

and operant training procedures on two matched sets of material, set 1, and set 2. Each set consisted of 8 words. Two different classes of measurements were taken:

1. In an individual room the subject's verbal imitation and verbal object labeling responses to verbal and non-verbal cues were assessed.
2. In the ward situation the subject's generalised verbal behaviour was measured on an eleven category behaviour code.

Figure 1. illustrates the design and the temporal order of the study.

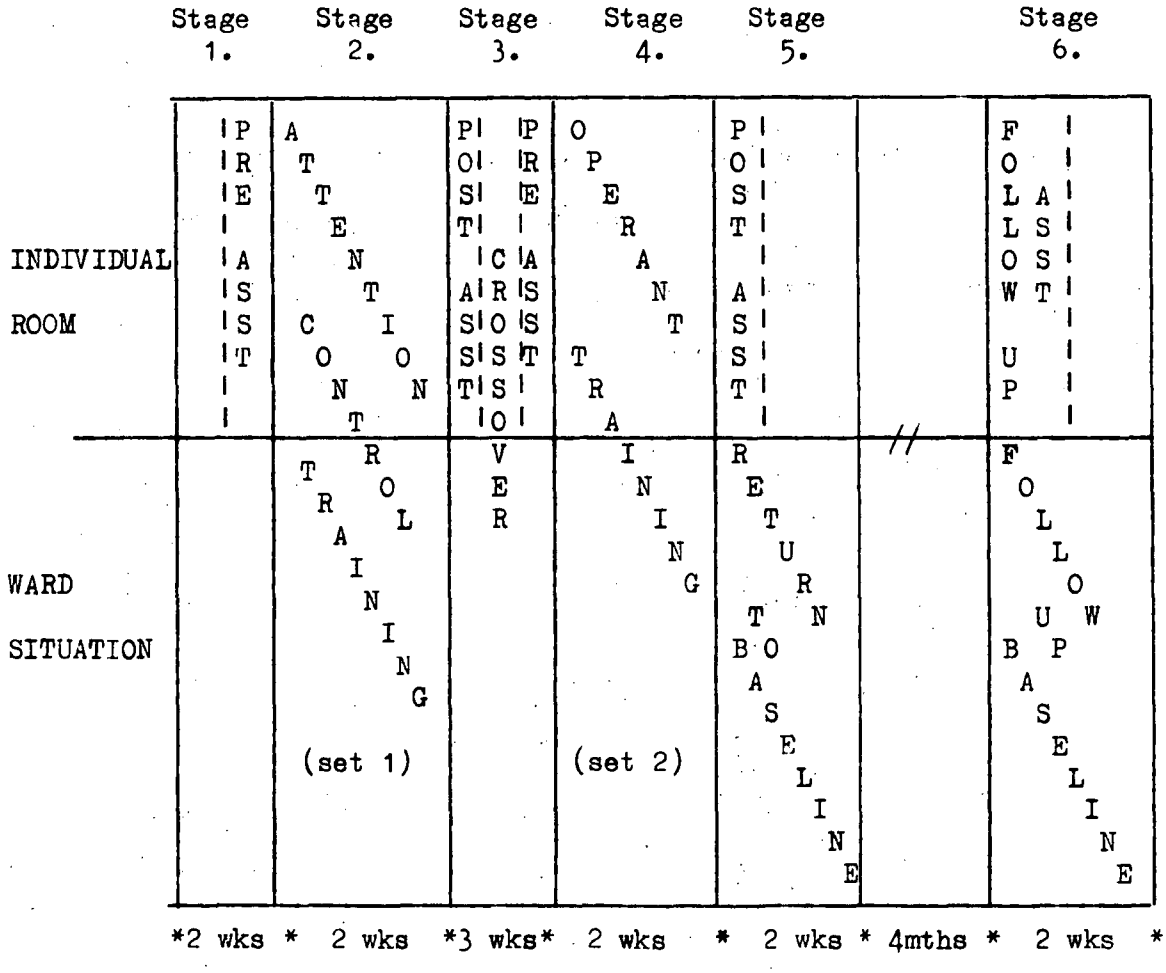

FIGURE 1. Design of the Study.

As schematically represented above, both the control and experimental procedures were applied in an individual and ward training situation. However, different behaviours were measured in the individual as compared to the ward situation. The details of the design will be considered in the 6 temporal stages outlined in Figure 1.

Stage 1 : Pre-Assessment

(a) Individual Room

Following evaluation of the subject's range of sounds by a speech therapist, and using the Phonetic Year Scale (Appendix 3) the subject's phonetic year level was determined. A pool of eleven consonents and ten vowels were derived. From these sounds sixteen words were formulated, balanced approximately in terms of difficulty into two groups of eight training words, set 1 and set 2. (The subject was trained with set 1 during the control procedures and set 2 during the experimental (operant) procedures.) In the pre-assessment, set 1 was presented by the Experimenter to the subject and his response tape recorded for later assessment. Contemporaneously, in the ward situation a baseline of the subject's verbal behaviour was tape recorded.

(b) Ward Situation : Baseline

The baseline data (2 weeks) was recorded (10 video taped

sessions, 20 minutes each) in the ward. Verbal behaviour was obtained by fitting the subject with a wireless transmitter. Voice transmittions were telemetered to a receiver in a distant observation booth. The video and audio recordings were continuous throughout the study in the ward situation.

Verbal behaviour was rated on an eleven category behavioural code (Appendix 4) developed by the experimenter. The code consisted of 9 categories including noises, sounds and words emitted by the subject to himself, to nurses and to other residents. Another two catergories involved words spoken to the subject by nurses or residents. The basic assumption for monitoring the subject's vocalisations was that they would indicate the subject's level and frequency of verbal communication in his normal environment.

Following the pre-assessment of set 1 and the baseline measures, the attention-control training procedures began in both the individual and ward situations.

Stage 2 : Attention-Control Procedures

(a) Individual Room

This phase consisted of eleven 20 minute training sessions over a 2 week period. All sessions were tape recorded to provide a continuous measure of the subject's performance on set 1.

Generally, the attention-control sessions were comprised of stimulating play and the pointing out of various training objects, for example, 'window'. The experimenter mentioned the verbal labels of the objects as frequently as practicable. During each session a test was used to check whether the subject could reliably discriminate a training object from a distractor object. In brief, the experimenter displayed a training object simultaneously with a distractor object. The subject reached criterion on the training object when he gave a series of 5 consecutive correct responses. Further, at the conclusion of each session the subject was given a 'sweet' in order to encourage him to come along to the next session.

To provide some similarity in structure to the operant training of set 2, the experimenter was reasonably directive and gave the subject opportunities to imitate experimenter's vocalisations. However, no systematic reinforcers followed the subject's acceptable responses. The procedures followed during the twenty, 20 minute morning training sessions are set out in detail below:

Sessions 1 - 5 : The subject was presented the objects and verbal labels, 'window', 'tie', 'door'. All objects were real life representations. Both the experimenter and subject, for example, pulled the 'window' up and down with the experimenter frequently saying 'window' and asking the subject, 'what is it?' (experimenter pointing to the window). The 'tie' was placed around the experimenter's

neck and the subject attempted to do it up while at the same time the experimenter said 'tie'. The 'door' was banged on, pointed to, and so on.

Sessions 6 - 11 : Initially it was anticipated that the subject, because of his short attention spand and sometimes 'silly' behaviour, would only endure one 20 minute session per morning. However, after five sessions the subject's response to training was consistently enthusiastic. He would literally run to the training room. Therefore it was decided to have two training sessions per day. The words used in sessions 6 - 11 were 'car', 'knee', 'towel', 'tie', 'door'. Typically three words were chosen for each session. Included in the apparatus were pencils, and chalk, so the subject could draw on and try to draw objects. If the subject misbehaved during sessions he was repremanded and told not to be silly.

Sessions 12 - 20 : Although enjoying the sessions the subject did not seem to approximate many training words. It was reasoned that a further intensification of the attention-control programme could improve the subject's verbal responses.

Three twenty minute training sessions were planned for each day. The subject was also asked to sit in his chair during the sessions in order that this would increase the probability of him paying greater attention to the experimenter. Each of the

morning training sessions in the individual room was followed by a complementary training programme in the ward during the afternoon sessions.

(b) Ward Situations

This phase consisted of eleven 20 minute video sessions over a 2 week period, and measured the subject's generalised verbal behaviour. That is, although the subject was taught set 1 verbal object labelling words, the actual responses measured were the subject's general verbal behaviour. Accordingly, the subject's verbal behaviour during training of set 1 was rated on the eleven category behaviour code.

In order to structure training procedure in the ward the experimenter posted on a notice board in the ward a 'nurses instruction sheet' (Appendix 5) to suggest to the nurses how they were to interact with the subject during the attention-control training sessions. In brief, these instructions recommended that nurses talked to, and played with the subject, that is, try and stimulate him verbally during the 20 minute afternoon training sessions. Consistent with the rationale for training in a number of situations it was requested that nurses presented the target words, used earlier in the morning special training room sessions. Consequently, following each morning session the experimenter wrote the relevant training

words on to the nurses instruction sheet. Although nurses were to use training words from the morning sessions that day, they could also use training words from the morning sessions of previous days.

A number of explicit suggestions were reffered to on the nurses instruction sheet, in an attempt to introduce a certain consistency and standardisation of approach in the training sessions. These included:

(1) Try to adopt a friendly, accepting attitude toward the subject.

(2) Set up object labelling games with the subject and other residents.

(3) Use a puppet to talk to the subject on different occasions.

(4) Talk to other residents and try to attract the subject into a social situation where he will have to respond in an appropriate verbal manner.

At the conclusion of these training sessions on the ward, the nurses' instruction sheet was to be removed.

It was reasoned that this would increase the likelihood that nurses would respond to the subject in a similar way to which they did prior to the attention control condition. Following the attention control procedures in the individual room and ward

situation, the cross-over phase began in both situations.

Stage 3 : Cross-Over

This phase was included in order to reduce the direct transfer of training effects from the attention control procedures to the operant procedures and act as a baseline for the operant training period.

(a) Individual Room

During this phase a post assessment of set 1 and a pre-assessment of set 2 was sequentially recorded.

(b) Ward Situation

Unfortunately, after 1 video session the subject began to engage in self-destructive behaviour. He plunged small objects into his ear. It was necessary for him to undergo ear surgery. Although no permanent damage was sustained, treatment took approximately 2 weeks, it was therefore possible to video only 2 sessions. Therefore proper evaluation of the subjects verbal behaviour on the ward during this phase was not possible. Further, these sessions were not included in the statistical analysis of the results. Following the cross-over stage, operant training procedures on set 2 began in both the individual and ward situations.

Stage 4 : Operant Training Procedures

(a) Individual Room

This phase consisted of eleven 20 minute training sessions over a two week period. All sessions were taped recorded to provide a continuous measure of the subject's performance on set 2. The number, clustering and duration of sessions were balanced with the attention-control condition. The operant training procedure used followed closely the method of the Lovaas Speech Training Programme (Appendix 4). However, clinical decisions were made during the course of training to tailor the Lovaas method to the subject's individual needs. The details of the present procedure are set out below, session by session.

Session 1. To center the subject's attention on the experimenter, and as a physical restraint measure the experimenter sat with the subject's legs between his own. During the session, the subject's percentage of fixating on the experimenter's mouth and his verbal response rate met the criterion recommended in the Lovaas programme.

The experimenter introduced the consonant 'p', however it was abandoned until later when it was realised that the subject would require extensive training to make the distinction between 'b', a consonant he used regularly, and the training consonant 'p'. Therefore it was decided to postpone presentation of 'p'-'pen' until later in the training. The experimenter adopted a continuous reinforcement schedule and the subject received a 'spoon of ice

cream' when he made an appropriate response.

Sessions 2 - 4. The consonant 'g' was initially trained by use of prompts to help the subject emit the correct response. Specifically, the experimenter placed his finger on the tip of his tongue and encouraged the subject to imitate his action, when the subject did so, the experimenter said 'g', over trials, the subject made acceptable responses. The consonant 'g' was then blended with'gun', until the word 'gun' was presented without blending or any other prompts, and the subject responded appropriately.

Sessions 5 - 9. In the early sessions the experimenter presented the word 'book'. It was considered that as the subject had already acquired the consonant 'b' that 'book' would be readily learned. Following its acquisition the experimenter tested whether the subject could distinguish between the imitative response 'gun' and 'book'. Discrimination was considered complete when the subject had made 5 consecutive correct responses for each training object, in the presence of a distractor object.

Sessions 10 - 17. These sessions involved the training stimuli, 'leg', 'apple', 'hand', 'hat', 'aeroplane'. There was a shift from continuous to an intermittent reinforcement schedule and a coupling of reinforcers. That is, ice cream and the social reinforcer 'good boy'.

Giving selected examples of slightly different procedural tacits seems appropriate. For instance, 'apple' was broken down at first into the behavioural units 'a-pul'. The subject rapidly made this imitation, and slowly over trials the experimenter presented the correct pronunciation of 'apple'. The subject emitted acceptable responses. 'Aeroplane', the most difficult of all the training stimuli was presented rhythmically in 3 syllables with an inflection at the end of each syllable. The subject made an attempt to imitate the sounds while simultaneously copying the rhythm.

Sessions 18-20. These were discrimination sessions to determine if the subject could distinguish verbally and non-verbally the training words. The experimenter held training objects behind his back and presented them randomly saying 'what is it?'. Also the experimenter put training objects on a table and nominated objects for the subject to retrieve.

(b) Ward Situation

This phase consisted of eleven 20 minute video sessions and measured the subject's generalised verbal behaviour. Accordingly, the subject's verbal behaviour during training of set 2 was rated on the eleven category behaviour code.

In order to structure the training procedure in the ward, the experimenter posted on a notice board in the ward a 'Nurses

Instruction Sheet' (Appendix 6). This was to inform the nurses how to train the subject in verbal object labelling during the 20 minute afternoon training sessions. The instructions basically followed the Lovaas training model. The structure of the sessions were to be set out as below.

'Step 1. Sit close to Mark so you get his attention and he is looking at you.

Step 2. Have a few objects close by for him to label.

Step 3. Present an object to Mark and say 'look Mark....'

Step 4. Allow him about 5 seconds to reply. If he gets it wrong, repeat step 3 six times, then show him a new object.

Step 5. If he responses correctly reinforce, say 'good boy', then for the next trial simply hold up the object and say 'what is it?'. If right reinforce.

Step 6. Present the same object 5 times.

Step 7. Move onto a new object and repeat the process outlined above.'

As with the control condition, the nurses were to present the target words used earlier in the morning special room sessions. Accordingly the experimenter wrote the relevant training words on the 'nurses Instruction Sheet' each afternoon. Also consistent with the control condition the nurses could use training words taught on previous mornings sessions in the special room.

For similar reasons as stated for the control condition the Nurses Instruction Sheet' was removed at the conclusion of training on the ward. However, it was anticipated that the nurses would continue to ask the subject to label objects because it was a rewarding experience for them.

Stage 5 : Return to Baseline

(a) Individual Room

During this phase a post assessment of set 2 was recorded.

(b) Ward Situation

This phase consisted of ten 20 minute video sessions over a two week period. This phase was included to test for the continuing effects of operant training.

Stage 6 : Follow-up

(a) Individual Room

During this phase the follow-up assessment of set 1 and set 2 were tape recorded.

(b) Ward Situation

This phase consisted of ten 20 minute video sessions over a

two week period. It was included in the study to test for the persisting effects of operant training.

Assessments of the Subject's Social Functioning

Social measures were recorded as a way of observing whether there was a positive correlation between the subject's verbal behaviour and social behaviour. The tests applied included the Adaptive Behaviour Scale (AAMD), a behaviour rating scale for mentally retarded. It was designed to provide objective descriptions and evaluations of an individual's adaptive behaviour (Fogelman 1975). The measures were recorded pre and post to both conditions and at the time of the follow-up phase.

CHAPTER THREE

RESULTS

The data consisted of measures of verbal behaviour in the individual and ward situations, and ratings of ward social behaviour. Each situation, and the social ratings will be considered separately.

3.1 INDIVIDUAL ROOM SITUATION

Two categories of data were assessed in the individual situation. In the first category, continuous measures taken during training were divided into verbal imitation and verbal object labelling. The second category of data was verbal object labelling, scores recorded at the pre, post, and follow-up stages. The first category, the continuous measures, will be considered below.

Continuous Measures. The subject's responses during the twenty 20 minute training sessions over two weeks in both conditions were tape recorded, and later analysed by speech therapists, 1 and 2. Both were unaware of the direction of the hypotheses. Inter-rater reliability was obtained using Pearson's r correlation co-efficient. The ranges of inter-rater reliability were as follows:

Experimenter presentations: Set 1, .8 - 1.0; Set 2, .8 - 1.0

Subject Verbal Imitations : Set 1, .7 - 1.0; Set 2, .7 - 1.0

Subject Verbal Object

Labellings: Set 1, .7 - 1.0; Set 2, .7 - 1.0

At stated, the continuous measures were divided into verbal imitation, and verbal object labelling.

(a). Verbal imitation results are shown in Table 1.

TABLE 1

Number of Presentaions of set 1 and set 2 words and the subject's verbal imitative responses.

Control (Set 1.)

Words	1	2	3	4	5	6	7	8	Total
No, of Presentations	343	324	245	41	269	165	60	90	1587
No. of Responses	38	8	15	13	97	32	3	19	225
% Responses	9.7	2.5	6.1	31.7	36.1	19.4	5.0	21.1	14.2

Experimental (Set 2.)

No. of Presentations	58	344	59	72	431	241	251	183	1639
No. of Responses	29	117	38	35	197	53	83	40	592
% Responses	50.0	34.0	64.4	49.0	45.8	21.9	23.0	21.9	36.1

Across the eight words the percentage response in the experimental condition (36.1) is more than double that of the control condition (14.2). Further, the subject emitted a significantly greater percentage of verbal imitative responses in the operant procedures as compared to the control procedures (by

sign test n=8, a=0, $p < .01$)

(b). Verbal object labelling measures were divided into two classes : the subject's total number of correct verbal object labelling of set 1 and set 2, and the subject's verbal object labelling of set 1 and set 2 to the criterion of five consecutive correct responses. Table 2 shows the first class of verbal object labelling measures.

Table 2.

The subject's total number of correct verbal object labelling of set 1 and set 2.

Words	1	2	3	4	5	6	7	8	Total
Control (set 1.)	2	0	0	6	14	14	0	11	45
Experimental (set 2.)	31	52	32	16	44	23	16	21	244

It is clear from the Table that the subject emitted a significantly greater number of verbal object labelling responses in the operant procedures as compared to the control-procedures. (by sign test n=8, a=0, $p < .01$).

The second class of verbal object labelling measures is shown in Table 3.

Table 3.

The subject's verbal object labelling of set 1 and set 2 to the criterion of 5 consecutive correct responses.

	Words	
	Correct	Incorrect
Control (set 1)	3	5
Experimental (set 2.)	6	2

Although the results are not significant (by Fishers Exact Test $p < .14$) it is clear that most of the words were learned in the experimental condition (6 as compared to 2), whereas for the control condition only a minority was learned (3 as compared to 5).

Pre, Post and Follow-up Measures: Table 4 indicates results for the pre, post and follow-up measures as scored by speech therapist 3. These scores show the subject's performance to criterion on set 1 and set 2.

Table 4.

Number of verbal object labelling responses performed to criterion on set 1 and set 2.

Words.

	PRE		POST		FOLLOW=UP	
	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect
Control (Set 1.)	1	7	3	5	1	7
Experimental (Set 2.)	1	7	6	2	6	2

Although the post assessment scores are not significant (by Fishers Exact test $p < 0.14$), the follow-up scores show that retention in the experimental condition is significantly greater than the control condition (by Fishers Exact Test, $p < 0.02$). It should be noted that the results from table 3 are consistent with the post assessment stage in table 4. These results reflect the same overall trend of better performance on set 2 than set 1.

3.2 WARD SITUATION

The ward data consisted of 20 twenty minute videotape sessions over two weeks. Measures were of the subject's generalised verbal behaviour and scored on an eleven variable behaviour code (Appendix 8). These variables included : Subject makes noise to self (SN), to nurses (SNN), to resident

(SNR). Noise is defined as a harsh or inarticulate sound, for example, 'ahh'. Other variables were subject makes sound to self (SS), to nurse (SSN), to resident (SSR). Sound is defined as an articulate utterance, specifically a consonant plus a vowel, for example, 'ma'. Further variables were, subject makes word to self (SW), to nurse (SWN), to resident (SWR). Word is defined as a sound capable of independent grammatical use. The variables directed to the subject were: nurse says word to subject (NWS), and resident says word to subject (RWS). The aim is to determine whether operant procedures are significantly more effective in increasing generalised verbal behaviour than control procedures.

Ratings of Generalised Verbal Behaviour: Two independent raters, unaware of the direction of the hypotheses, rated the data using a time sampling method. The time sampling technique of direct observation has the advantage of providing time intervals so that the observers can turn their attention to the details of the record (Costello, 1973). The time intervals used were thirty seconds on-rating and thirty seconds off-rating. The percentage method (Costello, 1973), has been used widely to describe the extent of difference between observers. Therefore this method was used to determine inter-rater reliability. It was felt that in the early stages of rating, the raters were most likely to disagree. Therefore, the first five video tapes were checked for inter-rater reliability over the eleven variables. After this point random

reliability checks were made. The range of reliability was from .7 to 1.0 on all variables.

Analysis of the data: The Burroughs B6700 version of the Statistical Package for the Social Sciences (Social Sciences data service) was used for all statistical analysis. The raw data scores were averaged and these scores are shown in Appendix 9. The medians, means and standard deviations are shown in table 5.

Table 5.

Medians, Means, and standard deviation of the eleven generalised verbal behaviour variables throughout conditions.

	S.N.			S.N.N.			S.N.R.			S.S.			S.S.N.			S.S.R.		
	M	$\bar{X}$	S.D.	M	$\bar{X}$	S.D.	M	$\bar{X}$	S.D.	M	$\bar{X}$	S.D.	M	$\bar{X}$	S.D.	M	$\bar{X}$	S.D.
Baseline	59.0	55.7	13.7	8.5	9.6	9.2	2.0	4.8	6.2	8.0	8.2	5.9	0.0	4.2	8.3	1.0	1.3	1.5
Control	49.0	48.4	10.7	3.0	5.7	6.6	4.0	6.2	7.1	8.0	7.0	5.0	0.0	3.3	7.5	0.0	1.5	2.3
Experimental	53.0	67.5	36.6	48.0	56.6	44.8	0.0	6.5	9.1	2.0	3.1	4.5	17.0	16.0	12.5	18.0	0.5	1.5
Return to Baseline	0.0	8.4	21.6	68.5	74.5	36.2	0.0	6.0	13.8	0.0	0.3	0.9	37.0	40.4	26.4	0.0	1.6	4.4
Follow-up	17.5	17.7	8.7	24.5	25.5	13.8	14.5	15.4	4.4	1.0	1.8	2.8	23.5	23.3	12.6	2.0	1.4	1.2
Bartlett's Box F.	6.35 p = 0.00			10.94 p = 0.00			3.18 p = 0.01			5.72 p = 0.00			4.97 p = 0.00			5.45 p = 0.00		

Table 5.

Continued.

	S.W.			S.W.N.			S.W.R.			N.W.S.			R.W.S.		
	M	$\bar{X}$	S.D.	M	$\bar{X}$	S.D.	M	$\bar{X}$	S.D.	M	$\bar{X}$	S.D.	M	$\bar{X}$	S.D.
Baseline	4.0	4.5	4.1	0.5	3.0	4.5	0.0	1.3	2.2	14.5	16.1	16.5	0.0	1.6	3.5
Control	4.0	4.4	3.2	0.0	2.1	3.3	0.0	0.5	1.0	90.0	105.5	67.7	1.0	3.5	5.2
Experimental	5.0	7.6	7.9	8.0	13.8	11.5	0.0	0.4	0.7	105.0	117.9	60.9	0.0	0.2	0.6
Return to Baseline	0.0	0.1	0.3	50.0	59.1	36.4	0.0	3.5	10.7	129.0	159.9	93.0	0.0	9.9	29.3
Follow-up	0.0	0.7	1.2	27.5	28.1	6.3	0.0	0.5	0.7	65.5	67.6	28.5	0.0	0.3	0.9
Bartlett's Box F.	16.15 p = 0.00			16.99 p = 0.00			25.82 p = 0.00			6.38 p = 0.00			34.05 p = 0.00		

From Table 5 the Bartlett Box F, a test of homogeneity of variance, shows that none of the eleven variables have homogeneous variances. In an attempt to make the variances of the variables homogeneous and to meet one of the assumptions of ANOVA the data was recoded (Appendix 10). The medians, means, and standard deviations of the recoded data are shown in table 6.

Table 6.

Medians, means and standard deviations of the recoded eleven general verbal behaviour variables.

	S.N.			S.N.N.			S.N.R.			S.S.			S.S.N.			S.S.R.		
	M	$\bar{X}$	SD	M	$\bar{X}$	SD	M	$\bar{X}$	SD	M	$\bar{X}$	SD	M	$\bar{X}$	SD	M	$\bar{X}$	SD
Baseline	3.5	3.4	0.7	1.0	0.9	0.6	2.0	4.0	4.4	8.0	6.7	3.8	0.0	0.4	0.7	1.0	1.3	1.5
Control	3.0	2.8	0.6	1.0	0.6	0.5	4.0	4.6	4.6	8.0	6.3	4.1	0.0	0.4	0.7	0.0	1.5	2.3
Experimental	3.0	3.7	1.7	3.0	3.3	2.1	0.0	4.1	5.2	2.0	2.6	3.1	1.0	1.2	0.7	0.0	0.5	1.5
Return to Baseline	0.0	0.7	1.3	4.0	4.1	2.0	0.0	2.7	4.4	0.0	0.3	0.9	2.5	2.5	1.3	0.0	1.2	3.2
Follow-up	1.0	1.4	0.5	2.0	1.8	0.6	10.0	10.3	0.5	1.0	1.8	2.8	2.0	1.7	0.7	1.5	1.4	1.2
Bartlett's Box F.	4.94 p= 0.00			8.40 p = 0.00			7.58 p = 0.00			3.84 p = 0.00			1.56 p = 0.18			2.87 p = 0.02		

Table 6.

Continued.

	S.W.			S.W.N.			S.W.R.			N.W.S.			R.W.S.		
	M	$\bar{X}$	SD	M	$\bar{X}$	SD	M	$\bar{X}$	SD	M	$\bar{X}$	SD	M	$\bar{X}$	SD
Baseline	4.0	4.3	3.7	0.5	0.5	0.5	0.0	1.3	2.2	1.0	1.3	0.9	0.0	1.5	3.2
Control	4.0	4.4	3.2	0.0	0.5	0.5	0.0	0.5	1.0	5.0	4.8	1.8	1.0	2.9	4.1
Experimental	5.0	5.6	3.5	1.0	1.3	0.6	0.0	0.4	0.7	6.0	5.5	1.8	0.0	0.2	0.6
Return to Baseline	0.0	0.1	0.3	3.0	3.5	1.8	0.0	1.2	3.5	7.0	6.0	1.5	0.0	1.7	3.8
Follow-up	0.0	0.7	1.2	2.0	1.9	0.3	0.0	0.5	0.7	4.0	4.0	1.4	0.0	0.3	0.9
Bartlett's Box F.	10.22 p = 0.00			8.79 p = 0.00			9.11 p = 0.00			1.04 p = 39			9.33 p = 0.00		

Table 6 shows the attempt made to improve homogeneity of variance by recoding principally extreme high values to reduce skew.

This proved of only limited success, only two variables (NWS, SSN) being homogeneous. The remainder were significantly non-homogeneous, although their skew (as shown by median and mean differences) was reduced. While not ideal from the statistical assumption point of view, it was still decided to perform an ANOVA on the recoded data. This decision was based on the notion that for the purposes of this study the interpretation advantages of ANOVA outweighed the disadvantages arising from not meeting the assumptions.

Accordingly, eleven one-way ANOVAs were performed on the data and are shown in table 7.

Table 7.

Summary of one-way ANOVA.

Variables	Source	DF	SS	MS	FF
SN	Between	4	70.11	17.53	15.05**
	Within	47	54.72	1.16	
SNN	Between	4	96.28	24.07	12.78**
	Within	47	88.49	1.88	
SNR	Between	4	353.65	88.41	4.96**
	Within	47	837.65	17.82	
SS	Between	4	326.16	81.54	8.11**
	Within	47	472.52	10.05	
SSN	Between	4	33.49	8.37	11.86**
	Within	47	33.18	0.71	
SSR	Between	4	6.52	1.63	0.38
	Within	47	199.55	4.25	
SW	Between	4	250.33	62.58	8.07**
	Within	47	364.19	7.75	
SWN	Between	4	64.19	16.05	78.48**
	Within	47	40.81	0.87	
SWR	Between	4	7.76	1.94	0.53
	Within	47	171.47	3.65	
NWS	Between	4	137.31	34.33	14.61**
	Within	47	110.46	2.35	
RWS	Between	4	54.19	13.54	1.59
	Within	47		8.49	

** $p < 0.01$

The ANOVA's show that a significant difference occurred in eight variables. Tests of homogeneous subsets were applied to these variables and the results are discussed separately.

(1). Subject, Noise to Self (SN): The results indicate that the experimental, control, and baseline conditions are not significantly greater than each other, but all are significantly greater than the return to baseline and follow up conditions.

(2). Subject, Sound to Self (SS): The experimental condition is not significantly greater than the control, or any other condition. But the control, and baseline conditions are significantly greater than the return to baseline and follow-up conditions.

(3). Subject, word to self (SW): The experimental condition is not significantly greater than the control condition. But the return to baseline condition is significantly greater than the baseline, control and experimental conditions. While the follow-up condition is not significantly greater than any other condition.

(4). Subject, Noise to Nurse (SNN): The experimental and return to baseline conditions are not significantly greater than each other, but both are significantly greater than the control and baseline conditions. While the follow-up condition is significantly less than return to baseline, yet not significantly greater than the experimental, control, and baseline conditions.

(5). Subject, Sound to Nurse (SSN): The experimental condition is not significantly greater than the control condition. The return to baseline condition is significantly greater than the

baseline, control, and experimental conditions, while the follow-up condition is not significantly greater than the experimental condition but is significantly greater than baseline and control conditions.

(6). Subject, Word to Nurse (SWN): The experimental condition is not significantly greater than the control, but the return to baseline condition is significantly greater than the baseline, control, experimental and follow-up conditions. While the follow-up condition is significantly greater than the baseline and control conditions, but not significantly greater than the experimental condition.

(7). Subject, Noise to Resident (SNR): The experimental condition is not significantly greater than the control condition. The follow-up conditions is significantly greater than the baseline, experimental and return to baseline conditions, while the control condition is not significantly greater than any other condition.

(8). Nurse, Word to Subject (NWS): The experimental condition is not significantly greater than the control condition. All conditions are not significantly greater than each other, exceptthe baseline conditions which is significantly less than the other conditions.

In summary, the experimental condition is significantly greater than the control condition on only one variable, SNN. Further, from the above it is clear that the Subject's self-directed noises (SN), sounds (SS), and words (SW) decreased in

the return to baseline and follow-up conditions, while the subject to nurse verbal behaviour increased during these periods. That is, it seems that when the subject was verbalising to nurses he did not vocalise much to himself and vice versa. In particular, the subject vocalised most to the nurses in the return to baseline condition. The subject's noises to residents (SNR) increased during the follow-up condition, but did not vary significantly across any other condition.

The results suggest that the variables grouped in self-directed, nurse-directed, and noise to resident groups. In order to further analyse these trends the data was factor analysed. It was of interest also to examine whether the subject's change in verbal behaviour over the conditions was as predicted or was related to the order in which the conditions were presented. Accordingly, the experimenter's expected order of effects was included as a variable, referred to as EXPCON, in the factor analysis. EXPCON was on an increasing scale, baseline, follow-up control, return to baseline and experimental. A second variable included in the factor analysis was COND, it represented the order in which the conditions were presented.

A varimax rotated factor matrix was performed on the data. In this type of factor analysis the first principle factor may be viewed as the single best summary of linear relationships exhibited

by the data. The second factor accounts for the most residual variance after the effect of the first factor is removed from the data. Subsequent factors are defined similarly until all the variance in the data is exhausted (Nie et al., 1975). The results of the factor analysis are shown in table 8.

Table 8.

Varimax Rotated Factor Matrix of the data.

	Factor 1	Factor 2	Factor 3	Factor 4
COND	0.65	0.36	-0.13	0.56
SN	-0.76	-0.00	-0.08	0.00
SNN	0.56	0.58	0.00	-0.21
SNR	-0.03	-0.19	0.26	0.58
SS	-0.54	-0.23	0.22	-0.31
SSN	0.83	0.32	-0.10	-0.16
SSR	-0.02	-0.08	0.59	0.05
SW	-0.59	0.13	0.16	-0.22
SWN	0.84	0.32	0.03	-0.08
SWR	0.01	-0.29	0.86	0.18
NWS	0.34	0.63	-0.14	-0.15
RWS	-0.09	-0.04	0.59	-0.36
EXPCON	-0.01	0.99	-0.09	0.05

The four factors from table 8 will be considered separately.

Factor 1: The three variables meaning vocalisation to self (SN (-0.76), SS (-0.54), SW (-0.59),) are negatively loaded on factor 1. In contrast the three variables meaning subject to nurse vocalisations (SNN (-0.56), SSN (0.83), SWN (0.84),) are positively loaded on factor 1. In brief, when the subject was vocalising to nurses, especially when emitting words and sounds, he tended not to vocalise to himself. This interpretation suggests a self-directed versus a nurse directed grouping factor. Further, COND (0.65) is positively loaded on factor 1. This shows that as the study progressed the subject vocalised less to himself and more to the nurses.

Factor 2: Factor 2 is mainly concerned with EXPCON. The variables SNN (0.58), NWS (0.63) and EXPCON (0.99) are loaded on factor 2. This suggests that in the experimental condition the interaction of the noises to the nurses, and the nurses talking to the subject was greater than during any other condition.

Factor 3: Factor 3 is concerned with subject - resident vocal communication. The variables SSR (0.59), SWR (0.86), RWS (0.59) were positively loaded on factor 3. However, ANOVA results reflect that all of these variables were not significant and therefore they will not be discussed further.

Factor 4: Factor 4 is concerned with subject noise to resident increasing through the experiment. This is represented by the variables SNR (0.58), COND (0.56) which are positively loaded on

factor 4.

From the above results it is clear that the main factor, factor1, (subject self-directed versus nurse directed vocalisations) supports the trend of the ANOVA results. Of particular interest is the EXPCON (0.99) loading with SNN (0.58) and NWS (0.63) on factor 2. This suggests that the nurse variable, NWS is the variable most affected by the experimental procedures. Furthermore, NWS is to some extent (0.34) loaded on factor 1, and given the unreliability of factor analysis, it is possible that any change from self-directed to nurse-directed communications reflects only the nurse's degree of involvement with the subject. Therefore to examine whether the subject's response to training was independent of simply an increase in the degree of nurse involvement during the study, it was decided to partial out NWS from the data. Accordingly, a factor analysis controlling for NWS was performed and the results are shown in table 9.

Table 9.

Varimax Rotated Factor Matrix controlling for NWS.

	Factor 1	Factor 2	Factor 3	Factor 4
COND	0.66	-0.14	0.40	0.55
SN	-0.78	-0.08	0.06	0.00
SNN	0.56	-0.00	0.63	-0.26
SNR	-0.04	-0.26	-0.14	0.59
SS	-0.55	0.23	-0.26	-0.27
SSN	0.82	-0.10	0.29	-0.17
SSR	0.03	0.60	-0.06	0.06
SW	-0.60	0.15	0.17	-0.22
SWN	0.84	0.02	0.30	-0.09
SWR	0.00	0.86	0.27	0.17
RWS	-0.86	0.60	-0.07	-0.02
EXPCON	0.05	0.11	0.84	-0.02

The results of the factor analysis controlling for NWS are similar to those of the first factor analysis. Therefore the four factors will be briefly discussed.

Factor 1: Factor 1 is concerned with subject vocalisations. Specifically self-directed (SN (-0.78), SS (-0.55), SW (-0.60),) versus nurse-directed (SNN (0.56), SSN (0.82), SWN (0.84),) vocalisations. This factor is positively loaded with COND (0.66).

That is, as the study progressed the subject vocalised less to himself and more to the nurses. Also RWS (-0.86) is negatively loaded on factor 1, that is, through the experiment residents talked less to the subject.

Factor 2: Factor 2 is concerned with subject-resident communication. In short, the variables SSR (0.60), SWR (0.86), RWS (0.60) are positively loaded on factor 2.

Factor 3: Factor 3 is concerned with EXPCON. The variables SNN (0.63), EXPCON (0.84) were loaded on factor 3. That is, the subject made most noises to the nurses in the experimental condition, than any other condition.

Factor 4: Factor 4 is concerned with subject noises to residents. The variables SNR (0.59), COND (0.55), are positively loaded on factor 4. Through the study the subject made more noises to residents.

3.3 SOCIAL RATINGS

The subject's behaviour was measured on the Adaptive Behaviour Scale at the pre and post stages of the control and operant procedures, and further, at the follow-up stage by ward staff. The scores are expressed in percentile rank and indicate the subject's level of functioning in relation to institutionally retarded persons of similar age. The results of these scores are shown in table 10.

Table 10.

Subject's ratings on Adaptive Behaviour Scale.

	Control		Experimental		Follow-up
Dimensions	pre	post	pre	post	
Independent Functioning	19	18	18	15	19
Language Development	15	14	18	19	21
Socialisation	9	8	11	22	28
Violent & Destructive Behaviour	55	55	92	85	85
Withdrawal	85	85	73	73	95
Self-abusive Behaviour	92	62	75	75	40

Table 10 shows that the most notable dimension is socialisation. There is a gradual increase over the study in the subject's social behaviour. Also the subject's violent and destructive behaviour sharply increased during the experimental and follow-up stage. The other dimensions fluctuate, but do not suggest any clear trends.

3.4 SUMMARY OF RESULTS

1. Individual Room Situation

a) Verbal Imitation: The subject made significantly more imitative-responses in the experimental procedures as compared to the control procedures.

b) Verbal Object Labelling: The subject emitted a significantly greater number of verbal object labelling responses in the experimental than in the control procedures. The results of the subject's verbal object labelling responses to criterion indicated no significant difference between conditions. However, the follow-up assessment showed that the subject retained significantly more verbal object labelling responses to criterion in the experimental procedures than in the control procedures.

Overall, the subject's verbal imitation and verbal object labelling performance was greater in the experimental procedures than in the control procedures.

2. Ward Situation

The most important result was that the subject vocalised less to himself and more to the nurses during the study. Further, the factor analysis controlling for NWS results showed that this change in direction of communication was not due to an increase in nurse involvement with the subject during the study. Reference

to ANOVA results indicated that the subject vocalisations to nurse was greatest in the return to baseline conditions.

Both factor analyses showed EXPCON loaded with the SNN variable. However, while subject did emit more noises to nurses in the experimental condition, ANOVA results show that the experimental condition was not significantly greater than the return to baseline condition. Consequently the return to baseline condition was the condition where the major performance effect was produced.

3. Social Ratings.

The Adaptive Behaviour Scale showed that during the study the subject's socialisation behaviour gradually increased, but also his violent and destructive behaviour.

CHAPTER FOUR

DISCUSSION

One central purpose of the study was to apply a comprehensive operant speech training programme to a cri-du-chat adolescent. Accordingly, the subject was trained in 2 situations, the individual room and ward, contemporaneously. It follows that there will be an interactional training effect between conditions. The analysis of results were separate for the 2 situations. The interactional effect was not partialled out as the emphasis in the study was on the effects of the complete operant approach. It is suggested that future research could partial out the separate components in a comprehensive speech programme.

The results of training in the individual and ward situations, and social ratings will be discussed separately.

4.1 INDIVIDUAL SITUATION

a) Verbal Imitation: The results indicate that the subject emitted a significantly greater proportion of verbal imitative responses in the operant procedures than in the control procedures. This result supports the findings of the other operant speech researchers (Lovaas, 1968; Sloane et al., 1968).

Effective components of the operant procedures included contingent reinforcement and the control of inattentive behaviour. Although the subject could model on the experimenter's verbal

behaviour in the control approach, no contingent reinforcers were applied. Consistent with Flanders (1968) findings, giving the subject the opportunity to model responses increased his verbal imitative behaviour. However, contingent reinforcement of verbal responses was significantly more effective than non-contingent training.

The subject's inattentiveness during training was clearly an important variable. As Maggs (1974) has reported retardates are often inattentive during teaching. Consequently training in the one-to-one individual situation was designed to reduce the subject's distractability. Despite this, the subject remained quite easily distractable during control procedures. The subject was physically restrained during the early operant training sessions. This approach is consistent with Hewett's (1965) emphasis on enviromental control during teaching. In short the subject responded more appropriately to teaching with the highly structured operant approach than the less structured control approach.

b) Verbal Object Labelling: The results showed that the subject's total number of verbal object labelling responses were significantly greater in the experimental than in the control procedures. Operant researchers (Sloane et al., 1968; Lovaas, 1968) regard verbal imitation as an initial step prior to verbal object

labelling to criterion. Consequently, when the subject was making verbal object labelling responses, but not to criterion, these responses could be regarded as part of an intermediate learning step, and would therefore indicate the subject was approaching verbal object labelling to criterion. However, the results of verbal object labelling responses to criterion were not significantly different between conditions. The results did suggest a trend. Specifically, the subject learnt more words (6) in the operant procedures than in the control procedures (3).

The follow-up assessment indicated that the subject emitted significantly more verbal object labelling words to criterion from the operant procedures (6) than from the control procedures (1). In point of fact this result suggests that the subject forgot the set 1 words he learned in the control procedures, and retained those set 2 words he learned in the experimental procedures. One explanation for the subject's lack of retention of set 1 words could be, as Rees (1976) has suggested, that retardates retain poorly what they had learned. However, this explanation is not consistent with the subject's retention of set 2 words. It seems a more adequate explanation, in this case, would be that set 2 words were reinforced in the ward following the experimental condition.

In summary, the results indicated that the operant procedures were significantly more effective in increasing verbal imitation, and the retention of verbal object labelling words to criterion in a cri-du-chat adolescent, than control procedures.

4.2 WARD SITUATION

Statistical analysis showed that the main result was that the subject vocalised less to himself through the study and more to the nurses. Furthermore, across the five conditions this result was greatest in the return to baseline condition. It is argued that this represents a rising performance effect which commenced during training in the experimental condition. This argument is supported by the observation that the subject's vocalisations to nurses decreased during the follow-up condition. If the subject had improved in performance merely as a consequence of a change over time it would be expected that his performance would be as great as, or greater than the return to baseline condition.

The subject's increase in vocalisations to the nurses and decrease in vocalisations to self through the study was an unexpected result. It was expected that the subject's entire range of generalised verbal behaviour would increase through

the study. However, it appears that the subject-nurse communication was more important to the subject than vocalising to himself.

The ANOVA results and the factor analysis controlling for NWS indicated that the significant increase in subject vocalisations to nurses was not caused by a correspondingly significant increase in nurse involvement with the subject. The most logical reason for the subject's increased vocalisations to the nurses in the return to baseline seems to lie in the nature or type of nurse communication to subject. This interpretation appears to be most appropriate for 2 reasons. Firstly, the nurses were contingently reinforcing the subject in the experimental condition and appeared to continue this procedure in the return to baseline. Secondly the subject seemed to respond to this training and sought the nurses out to communicate with them. Consequently, it is argued that operant training was significantly more effective in increasing subject vocalisations to nurses in a cri-du-chat adolescent than the control procedures. This result would support Lovaas' et al., (1967) view in terms of the efficacy of nurses as operant speech trainers.

In addition the effect of subject vocalising less to himself and more to the nurses adds to Hewett's (1965) and Schneider

and Vallon's (1955) general argument that speech training increases the trainees social level.

The finding of a decrease in subject vocalisations to nurses in the follow-up condition as compared to the return to baseline condition needs comment. This suggests that while training the subject in the ward is valuable, it is necessary to continue training sessions, intermittantly over a long time period to maintain the behaviour. Ideally, intensive initial training followed by training sessions at regular intervals are indicated.

Another interesting result was that the subject made more noises to residents as the study progressed. This finding is consistent with the subject becoming more socialised. However, although subject increased communication with residents, there was a non-significant trend for the residents through the study to respond less to the subject. It is possible that some residents became passively aggressive toward the subject because he was receiving nurse attention. Training which increases subject-nurse communication, but alienates the subject from his social group is not desirable. This possibility during speech training deserves attention. It is suggested efforts should be made by nurses to include other residents in the training sessions.

In summary, operant speech training was significantly more effective than control procedures in increasing a cri-du-chat' adolescent's vocalisations to the nurses.

4.3 SOCIAL RATINGS

The results indicated that the subject's behaviour increased in both socialisation and violent and destructive behaviour from the control to the operant procedures. It seemed the subject became more extrovert (outgoing) during the experimental (operant) procedures. However, because of the subject's severe level of mental retardation, during his contact with others he appeared to lack the necessary descrimination between socially acceptable and inappropriate behaviour. The subject is a strong adolescent but has poor co-ordination. Therefore, at times, when he was trying to befriend another resident he was unintentionally excessively rough and drove the resident away.

The subject was also becoming more adventurous but had not developed the social skills necessary to cope with his out-going needs. Therefore social skills training is indicated.

CHAPTER FIVE

CONCLUSION

The results support the view that, like cases of other retardation syndromes, a cri-du-chat adolescent could benefit from a speech training programme. Furthermore, that operant speech training conducted in two situations, an individual room and the ward, contemporaneously was significantly more effective than a combined control approach. In addition social ratings indicated that during operant training the subject became both appropriately and inappropriately outgoing. Social skills training was suggested to help the subject cope with demanding social situations.

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APPENDIX 1

CHROMOSOMAL ANALYSIS.

UNIVERSITY OF TASMANIA DEPARTMENT OF MEDICINE

CYTOGENETICS LABORATORY

MR
FULL NAME M.M. ~~MRS~~
REFERRED BY Dr.Fricker SEX M AGE 1960 ~~MISS~~
HOSPITAL Royal Derwent
TISSUE EXAMINED Peripheral Blood & Buccal Smear

SEX CHROMATIN STATUS: Negative

CHROMOSOME COUNT DISTRIBUTION

CHROMOSOMES/CELL	45	45	46	47	47	TOTAL CELLS COUNTED
NUMBER OF CELLS	4	1	16			21
SEX CHROMOSOMES	XY					

All cells analysed had deleted short arms of one member of the B group chromosome, (presumably B5). There was a random loss of chromosome from 5 cells probably due to the preparation. No other abnormality was detected. This confirms the clinical diagnosis of cri-du-chat.

NO. 73/170 DATE 6/12/73 SIGNATURE J.Cox

Original copy held at Royal Derwent Hospital, New Norfolk, Tasmania.

APPENDIX 2

LARYNGOSCOPIC EXAMINATION

M.M.

Cri-Du-Chat

Larynx - visualised under G.A. and anectine relaxant.

False cords are funnel shaped with small opening so that true cords could not be clearly visualised. True cords appeared to be of normal size as an endotrachael tube of the correct size for his age, was passed without difficulty.

(N.B. - a younger girl with Cri-Du-Chat Syndrome - aged approximately 4 years also had funnel shaped false cords with a small opening. In this case the true cords also appeared smaller than normal for age as it was impossible to pass an appropriately sized endotrachael tube in her case. Perhaps the larynx tends to normalise with age and growth.)

(S.Fricker)

29/11/76

APPENDIX 3

BEHAVIOUR CODE.

BEHAVIOUR CODE

S = Subject (M.M.)

R = Resident

N = Nurse

VERBAL:

S.N. Subject makes a noise to himself. Noise is defined as the S emitting a loud outcry, any sound, harsh or undesired i.e. inarticulate sounds. e.g. ahh!

S.N.N. Subject makes a noise to a nurse.

S.N.R. Subject makes a noise to a resident.

S.S. Subject makes a sound(s) to himself. Sound is defined as the emitting of any of a series of articulate utterances, specifically a consonant plus vowel.

S.S.N. Subject makes a sound to a nurse.

S.S.R. Subject makes a sound to a resident.

S.W. Subject emits a word(s) to himself. Word(s) is defined as sound(s) constituting minimal element of speech having meaning and capable of independent grammatical use.

S.W.N. Subject emits word(s) to a nurse.

S.W.R. Subject emits word(s) to resident.

N.W.S. Nurse emits word(s) to subject.

R.W.S. Resident emits word(s) to subject.

APPENDIX 4.

PHONETIC YEAR SCALE

PHONETIC YEAR SCALE

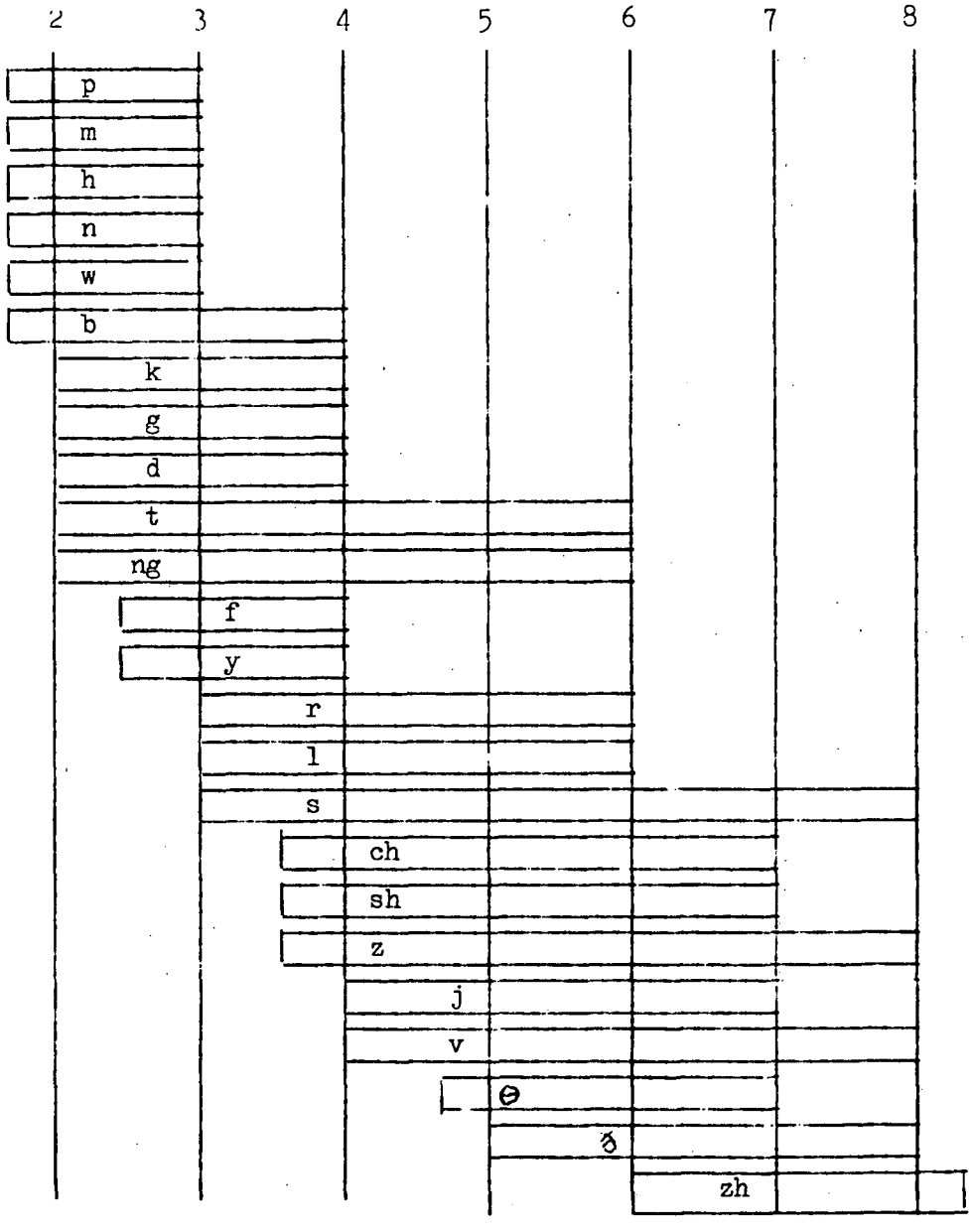

Figure 1. Average age estimates and upper age limits of customary consonant production. The solid bar corresponding to each sound starts at the median age of customary articulation; it stops at an age level at which 90% of all children are customarily producing the sound. (From Templin, 1957).

APPENDIX 5

NURSES' INSTRUCTION SHEET

NURSES' INSTRUCTION SHEET

The aim of this exercise is to help M.M. develop more speech. One very successful way to do this is to talk to and stimulate M. M.will be also trained in individual morning sessions with a number of objects, for him to label. In order to help M learn to label these objects a list of current words and previous words used in morning sessions, will be put on this sheet. It is essential that you stimulate M with the current morning words in the afternoon sessions. In addition you may also like to use the words from the previous list.

E.G. Day 1. Current List Previous List

____ ____

____ ____

____ ____

The general approach to training is set out below:-

1. Try to adopt a friendly, accepting attitude toward the subject.
2. Set up object labelling games with the subject and other residents.
3. Use a puppet to talk to the subject on different occasions.
4. Talk to other residents and try to attract the subject into a social situation where he will have to respond in an appropriate verbal manner.

APPENDIX 6

LOVAAS' PROGRAMME

LOVAAS' PROGRAMME

There are 2 phases of training -

(1) VERBAL IMITATION 4 steps.

(1) Subject was reinforced for all vocalisations and for fixating on the Experimenter's mouth. Criterion was reached when subject made 1 verbal response every 5 seconds and fixates 50% of the time.

(2) Subject was reinforced when he vocalises within 6 seconds after the Experimenter's vocalisation. An attempt was made to bring the subject's verbal behaviour under verbal control of the Experimenter. Criterion was reached when the frequency of the subject's verbal responses within the 6 seconds interval has trippled.

(3) Subject must try to match the Experimenter's sound. Each closer approximation was reinforced.

(4) Same procedure as in (3) but a new sound is introduced. To ensure discrimination between sounds in step (3) and (4) the sounds are interspersed on a random ratio 1 : 3.

(2) ESTABLISHMENT OF AN APPROPRIATE CONTEXT FOR SPEECH

The child was taught to correctly verbalise and identify common objects. The subject was involved in both verbal and non-verbal discrimination. For example, a training stimulus was presented, such as a "toy". As soon as the subject visually fixated the stimulus the Experimenter says "TOY". The subject

responded to the prompt and was immediately reinforced. The training stimulus was removed and re-presented at the next trial, - the prompt was gradually faded, e.g. "t.." only. Eventually the prompt was dropped and the subject responded to the presentation of the training stimulus alone. A new training stimulus was then presented.

In the second discrimination the Experimenter asked the subject to non-verbally identify a particular object, e.g. point to .... He was prompted - Experimenter may pick up subject's hand and point it toward the object. As before this response was gradually faded, until it was mastered. To ensure discrimination various trained stimulus are interspersed with new training stimulus.

APPENDIX 7

NURSES' INSTRUCTION SHEET

NURSES' INSTRUCTION SHEET

The aim of this exercise is to help M.M. develop more speech. One very successful way to do this is to reinforce what M says.

M will be taught to label objects in individual morning training sessions. To help him learn these words and encourage his speech the words used in the morning will be put on the current list below. It is essential that you present these words to M. in the afternoon sessions. In addition words on the previous list may also be used.

e.g. Day 1	Current List	Previous List
	———	———
	———	———
	———	———

The way to present the objects to M. are set out below:-

Step 1. Sit close to M so you get his attention and he is looking at you.

2. Have a few objects close by for him to label.

3. Present an object to M and say 'look M...'

4. Allow him about 5 seconds to reply. If he gets it wrong, repeat step 3 six times, then show him a new object.

Step 5. If he responses correctly reinforce, say 'good boy', then for the next trial simply hold up the object and say 'what is it?' If right reinforce.

6. Present the same object 5 times.

7. Move onto a new object and repeat the process outlined above.

APPENDIX 8

AVERAGED RAW DATA

AVERAGED RAW DATA.

	SN	SNN	SNR	SS	SSN	SSR	SW	SWN	SWR	NSW	RWS
100. 1.	62.	19.	5.	5.	12.	1.	1.	6.	0.	12.	0.
110. 1.	42.	11.	9.	8.	5.	1.	3.	13.	3.	17.	11.
120. 1.	65.	14.	10.	13.	0.	0.	7.	2.	0.	21.	0.
130. 1.	48.	27.	0.	8.	25.	4.	4.	1.	0.	50.	0.
140. 1.	69.	3.	19.	8.	0.	3.	10.	0.	6.	2.	0.
150. 1.	54.	1.	1.	17.	0.	0.	12.	0.	0.	2.	1.
160. 1.	48.	0.	1.	3.	0.	1.	0.	0.	0.	0.	0.
170. 1.	30.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
180. 1.	65.	6.	3.	17.	0.	3.	4.	8.	4.	32.	4.
190. 1.	74.	15.	0.	3.	0.	0.	4.	0.	0.	25.	0.
200. 2.	70.	0.	0.	0.	0.	0.	0.	0.	0.	40.	1.
210. 2.	47.	2.	14.	4.	0.	5.	4.	0.	0.	53.	0.
220. 2.	60.	0.	20.	2.	0.	0.	4.	1.	3.	66.	0.
230. 2.	42.	3.	2.	9.	23,	4.	6.	9.	0.	117.	11.
240. 2.	33.	0.	14.	8.	0.	0.	6.	2.	0.	110.	7.
250. 2.	39.	16.	4.	12.	0.	6.	8.	0.	0.	29.	0.
260. 2.	52.	14.	5.	6.	0.	0.	4.	0.	1.	229.	0.
270. 2.	37.	3.	9.	10.	1.	0.	9.	3.	2.	82.	15.
280. 2.	53.	11.	0.	0.	0.	2.	7.	8.	0.	116.	2.
290. 2.	50.	14.	0.	12.	12.	0.	0.	0.	0.	228.	0.
300. 2.	49.	0.	0.	14.	0.	0.	0.	0.	0.	90.	2.
340. 4.	50.	25.	9.	3.	9.	0.	5.	8.	1.	58.	0.
350. 4.	96.	13.	16.	4.	0.	1.	7.	0.	0.	52.	0.
360. 4.	114.	4.	0.	2.	0.	0.	15.	7.	0.	50.	0.
370. 4.	38.	105.	0.	2.	36.	0.	28.	4.	0.	210.	0.
380. 4.	53.	48.	0.	3.	17.	5.	9.	13.	1.	81.	0.
390. 4.	113.	81.	0.	16.	7.	0.	5.	5.	0.	132.	0.
400. 4.	33.	15.	3.	3.	6.	0.	7.	28.	0.	105.	0.
410. 4.	9.	144.	0.	1.	28.	0.	4.	22.	0.	225.	0.
420. 4.	42.	42.	0.	0.	27.	0.	2.	30.	0.	158.	0.
430. 4.	96.	48.	19.	0.	28.	0.	0.	5.	0.	138.	0.
440. 4.	98.	98.	24.	0.	18.	0.	2.	30.	2.	88.	2.
450. 5.	69.	33.	44.	3.	10.	0.	1.	7.	1.	54.	6.
460. 5.	12.	38.	0.	0.	21.	0.	0.	24.	0.	137.	0.
470. 5.	0.	134.	0.	0.	74.	0.	0.	109.	0.	254.	0.
480. 5.	0.	66.	9.	0.	17.	14.	0.	59.	34.	75.	93.
490. 5.	0.	126.	0.	0.	68.	0.	0.	104.	0.	345.	0.
500. 5.	0.	71.	0.	0.	46.	0.	0.	109.	0.	241.	0.
510. 5.	0.	39.	0.	0.	28.	0.	0.	38.	0.	92.	0.
520. 5.	2.	75.	0.	0.	52.	2.	0.	41.	0.	105.	0.
530. 5.	0.	105.	0.	0.	77.	0.	0.	55.	0.	175.	0.
540. 5.	1.	58.	7.	0.	11.	0.	0.	45.	0.	121.	0.
550. 6.	16.	22.	19.	1.	6.	2.	2.	30.	0.	65.	0.
560. 6.	35.	36.	14.	6.	31.	3.	3.	26.	1.	133.	0.
570. 6.	7.	53.	16.	1.	46.	0.	0.	36.	2.	14.	0.
580. 6.	24.	13.	15.	3.	10.	3.	0.	20.	0.	66.	0.
590. 6.	7.	11.	26.	0.	24.	2.	0.	21.	0.	61.	3.
600. 6.	12.	7.	10.	1.	13.	2.	0.	40.	0.	70.	0.
610. 6.	21.	21.	12.	0.	23.	1.	0.	25.	1.	61.	0.
620. 6.	19.	34.	13.	0.	31.	0.	0.	30.	0.	62.	0.
630. 6.	24.	31.	15.	1.	35.	1.	2.	29.	1.	70.	0.
640. 6.	12.	27.	14.	0.	14.	0.	0.	24.	0.	74.	0.

APPENDIX 9.

RECODED DATA

RECODED DATA

	SN	SNN	SNR	SS	SSN	SSR	SW	SWN	SWR	NSW	RWS
100. 1.	4.	1.	5.	5.	1.	1.	1.	1.	0.	1.	0.
110. 1.	3.	1.	9.	8.	1.	1.	3.	1.	3.	1.	10.
120. 1.	4.	1.	10.	10.	0.	0.	7.	1.	0.	2.	0.
130. 1.	3.	2.	0.	8.	2.	4.	4.	1.	0.	3.	0.
140. 1.	4.	1.	11.	8.	0.	3.	10.	0.	6.	1.	0.
150. 1.	3.	1.	1.	11.	0.	0.	10.	0.	0.	1.	1.
160. 1.	3.	0.	1.	3.	0.	1.	0.	0.	0.	0.	0.
170. 1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
180. 1.	4.	1.	3.	11.	0.	3.	4.	1.	4.	2.	4.
190. 1.	4.	1.	0.	3.	0.	0.	4.	0.	0.	2.	0.
200. 2.	4.	0.	0.	0.	0.	0.	0.	0.	0.	2.	1.
210. 2.	3.	1.	10.	4.	0.	5.	4.	0.	0.	3.	0.
220. 2.	3.	0.	11.	2.	0.	0.	4.	1.	3.	4.	0.
230. 2.	3.	1.	2.	9.	2.	4.	6.	1.	0.	6.	10.
240. 2.	2.	0.	10.	8.	0.	0.	6.	1.	0.	6.	7.
250. 2.	2.	1.	4.	10.	0.	6.	8.	0.	0.	2.	0.
260. 2.	3.	1.	5.	6.	0.	0.	4.	0.	1.	7.	0.
270. 2.	2.	1.	9.	10.	1.	0.	9.	1.	2.	5.	10.
280. 2.	3.	1.	0.	0.	0.	2.	7.	1.	0.	6.	2.
290. 2.	3.	1.	0.	10.	1.	0.	0.	0.	0.	7.	0.
300. 2.	3.	0.	0.	10.	0.	0.	0.	0.	0.	5.	2.
340. 4.	3.	2.	9.	3.	1.	0.	5.	1.	1.	3.	0.
350. 4.	5.	1.	11.	4.	0.	1.	7.	0.	0.	3.	0.
360. 4.	6.	1.	0.	2.	0.	0.	10.	1.	0.	3.	0.
370. 4.	2.	6.	0.	2.	2.	0.	11.	1.	0.	7.	0.
380. 4.	3.	3.	0.	3.	1.	5.	9.	1.	1.	5.	0.
390. 4.	6.	5.	0.	11.	1.	0.	5.	1.	0.	7.	0.
400. 4.	2.	1.	3.	3.	1.	0.	7.	2.	0.	6.	0.
410. 4.	1.	7.	0.	1.	2.	0.	4.	2.	0.	7.	0.
420. 4.	3.	3.	0.	0.	2.	0.	2.	2.	0.	7.	0.
430. 4.	5.	3.	11.	0.	2.	0.	0.	1.	0.	7.	0.
440. 4.	5.	5.	11.	0.	1.	0.	2.	2.	2.	5.	2.
450. 5.	4.	2.	11.	3.	1.	0.	1.	1.	1.	3.	6.
460. 5.	1.	2.	0.	0.	2.	0.	0.	2.	0.	7.	0.
470. 5.	0.	7.	0.	0.	4.	0.	0.	6.	0.	7.	0.
480. 5.	0.	4.	9.	0.	1.	10.	0.	3.	11.	4.	11.
490. 5.	0.	7.	0.	0.	4.	0.	0.	6.	0.	7.	0.
500. 5.	0.	4.	0.	0.	3.	0.	0.	6.	0.	7.	0.
510. 5.	0.	2.	0.	0.	2.	0.	0.	2.	0.	5.	0.
520. 5.	1.	4.	0.	0.	3.	2.	0.	3.	0.	6.	0.
530. 5.	0.	6.	0.	0.	4.	0.	0.	3.	0.	7.	0.
540. 5.	1.	3.	7.	0.	1.	0.	0.	3.	0.	7.	0.
550. 6.	1.	2.	11.	1.	1.	2.	2.	2.	0.	4.	0.
560. 6.	2.	2.	10.	6.	2.	3.	3.	2.	1.	7.	0.
570. 6.	1.	3.	11.	1.	3.	0.	0.	2.	2.	1.	0.
580. 6.	2.	1.	10.	8.	1.	3.	0.	1.	0.	4.	0.
590. 6.	1.	1.	11.	0.	2.	2.	0.	2.	0.	4.	3.
600. 6.	1.	1.	10.	1.	1.	2.	0.	2.	0.	4.	0.
610. 6.	2.	2.	10.	0.	2.	1.	0.	2.	1.	4.	0.
620. 6.	1.	2.	10.	0.	2.	0.	0.	2.	0.	4.	0.
630. 6.	2.	2.	10.	1.	2.	1.	2.	2.	1.	4.	0.
640. 6.	1.	2.	10.	0.	1.	0.	0.	2.	0.	4.	0.